Prepared for:

Chino Mines Company

Hurley, New Mexico

Administrative Order on Consent

Interim Remedial Action
Groundhog No. 5 Stockpile
Site Investigation Work Plan
Hanover and Whitewater Creeks
Investigation Units

Prepared by:

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TABLE OF CONTENTS

TABLES

FIGURES

PHOTOGRAPHS

1. INTRODUCTION

This work plan was prepared by Golder Associates Inc. (Golder) for Chino Mines Company (Chino) to guide a site investigation of the Groundhog No. 5 Stockpile, within the Hanover/Whitewater Creeks Investigation Units (H/WCIUs). The purpose of this investigation is to define the chemical nature and physical extent of the Groundhog No. 5 Stockpile sufficiently for Chino to evaluate interim remedial actions. This investigation will be consistent with a long-term strategy for closure/closeout and will meet standards prescribed in the Administrative Order on Consent (AOC) agreement and the New Mexico Mining Act and Rules.

The study area is shown on Figures 1 and 2. The objectives of the investigation are to:

- characterize the chemical nature of the stockpile and underlying materials,
- estimate the vertical extent of the stockpile,
- delineate the surface water sub-basin,
- identify any seeps and springs in the immediate area, and
- characterize the chemistry of the surface water in Lucky Bill Canyon below the stockpile.

Chemical characterization of the stockpile materials will include acid-base accounting (ABA), total metals analysis, paste pH, and Synthetic Precipitation Leachate Procedure (SPLP). The results of these analyses will be used to predict the environmental behavior of the stockpile material and potential effects on underlying materials, surface water, or groundwater.

Stockpile samples will be collected from test pits excavated by trackhoe. A minimum number of samples will be collected as stated in this work plan and additional samples may be collected based on the heterogeneity of materials encountered during fieldwork. The investigation will employ Standard Operating Procedures (SOPs) developed for the H/WCIUs (Chino and Steffen, Robertson, and Kirsten, 1997). After completion of sampling activities, the coordinates of the sample sites and crest and toe locations staked during the field investigation will be surveyed by a Chino employee or contractor.

This work plan is organized into 10 sections as follows:

Section 1 – Introduction describes strategy and organization of this work plan;

Section 2 – Site Description summarizes the history and physical setting of the stockpile;

Section 3 – Field Sampling Plan discusses procedures to be employed for test pit sampling;

Section 4 – Quality Assurance/Quality Control Samples discusses the collection of Quality Assurance/Quality Control Samples;

Section 5 - Sample Designation discusses the procedure used to assign sample numbers;

Section 6 – Decontamination Procedure describes the procedures that will be used to decontaminate reusable sampling equipment;

Section 7 – Sample Handling and Analysis describes the field sampling methods, analytical suites, and analysis methods;

Section 8 – Surface Water Sub-basin, Seep, and Spring Survey describes visual inspection methods for mapping surface water features;

Section 9 – Reporting – discusses the letter of completion; and

Section 10 - References lists the references used in preparing this document.

2. SITE DESCRIPTION

The Groundhog No. 5 Stockpile is a small stockpile (less than 2 acres) associated with the Groundhog No. 5 Shaft located in a cut in the north wall of Lucky Bill Canyon near its confluence with Bayard Canyon. The location of the stockpile is shown on Figure 2; photographs of the stockpile and site infrastructure are included as Photographs 1 and 2. The site consists of the stockpile, a headframe, and machine house near the shaft. The stockpile obscures original surface topography, but visual inspection of the toe of the stockpile indicates that it was probably initially situated on a steep slope and, because area soils are generally relatively thin, that bedrock was likely at or very near the pre-mining land surface.

The primary ores at the site were lead and zinc sulfide forms occurring in mineralized veins below the Sugarlump and Kneeling Nun Tuffs visible at the surface in the canyon. The tuffs overlie Cretaceous-Tertiary sediments (the Colorado Formation), which in turn overlie a series of Paleozoic limestones and shales. As with much of the Central Mining District, the mineralized veins are associated with faults that served as local conduits for mineralizing fluids. The Paleozoic rocks host much of the mineralization and appear to comprise the majority of stockpile material at the site based on inspection of the surface of the stockpile during a preliminary site visit on May 11, 2004.

Other stockpile material types noted at the preliminary site inspection include limestone, granodiorite and what appears to be fill material derived from the Sugarlump Tuff during the initial stages of shaft development. Stockpile material at the site consists of coarse-grained cobbles as classified by the U.S. Department of Agriculture particle size classification system. Stockpile materials are currently not covered or revegetated. Iron staining is minimal and appears to be restricted to small, isolated locations on the stockpile associated with finer-grained, mineralized material.

Two shallow groundwater monitoring wells (GH-97-03 and GH-97-04) are located adjacent to the stockpile (Figure 2). These wells were installed under the AOC in 1997 to collect samples of shallow groundwater in the alluvium/colluvium perched on the bedrock surface. They were sampled and analyzed for dissolved metals in August and September 1997, before and after rain events (DBS&A, 1997). Metals concentrations in Well GH-97-03 did not exceed NMWQCC standards (Golder, 2000). Well GH-97-04, at the toe of the Groundhog No. 5 Stockpile, was dry. The wells were inspected again in July 2004. Well GH-97-04 was dry, and well GH-97-3 was filled with sand.

3. TEST PIT SAMPLING PLAN

This section discusses the method of test pit excavation, test pit numbers and locations, and sampling procedures.

3.1 Test Pit Excavation and Description

The proposed sampling regime involves test pit sampling by trackhoe at a minimum of three locations on the stockpile. Final test pit locations will be selected by the project geologist with concurrence of NMED staff at the time of test pit excavation to best define material types and the vertical and lateral extent of the stockpile. Chino will coordinate the excavation with the New Mexico Environment Department (NMED).

Based on visual observations during the preliminary site inspection on May 11, 2004, the stockpile does not appear to have any significant spatial zoning. Isolated locations of surface staining will be targeted for test pitting to explore the depth of the staining where possible. One test pit will be excavated as a trench across stockpile/tuff fill contact near the location of the headframe to determine the northern extent of the stockpile. At least two other test pits will be excavated in thicker portions of the stockpile to investigate the character of the stockpile material with depth. Test pits will be excavated in the central portion of the top of the stockpile away from the crest to ensure excavation on stable ground. Test pits will be excavated through the entire interval of stockpile materials and into the underlying soil and/or weathered bedrock where possible. This will require a trackhoe excavator with an extended arm (minimum 20-foot reach).

Details of the excavation protocol are given in AOC SOP 21, "Sample Collection from Soil Borings, Excavations and Hand-dug Pits," with modifications for excavations deeper than 4 feet. SOP 21 was written assuming the sampler would be in the pit for hand-sampling. Because stockpile thickness is likely to exceed 20 feet, sampling at depths greater than 4 feet below ground surface (ft bgs) will be accomplished using material from the bucket of the excavator. Composite sampling described in SOP 21 will therefore also be modified to allow for collection of discrete samples from the excavator bucket and compositing of these samples as described in Section 3.3.

Soil descriptions will be recorded in the field logbook as stated in SOP 21. If applicable, a description of the root zone will be recorded, as well as the stratigraphy and staining of soils underlying the stockpile materials, and any other identifying characteristics.

Photographs of the pit and excavated materials will be taken. Sampling activities will be documented according to SOP 2, "Field Logbook" and summarized on a field test pit log.

Test pit locations will be surveyed by Chino personnel to obtain survey coordinates. Prior to test pit excavation, below-ground utilities will be located in the field by Chino's Bluestake Team. Inspections for utilities will be performed on the top of the stockpile, and the locations of buried utilities will be clearly marked prior to test pit excavation.

3.2 Sample Types and Numbers

For each test pit, samples will be taken from a minimum of three depth intervals in the stockpile:

- Surface stockpile samples – Based on the visible characteristics of stockpile materials, the thickness of an outer oxidized layer will be estimated by the field geologist, and a composite sample will be taken from this interval. In the event that no such layer is visually discernible, a composite sample will be taken from a depth not to exceed 2 ft bgs.
- Subsurface stockpile samples – A composite sample will be taken from a depth between the surface layer and the contact between stockpile materials and bedrock.
- Underlying materials – If a soil layer is present between subsurface stockpile materials and bedrock that is judged by the field geologist, with concurrence of NMED staff, to be significantly different in its chemical composition from other subsurface materials, a grab sample will be taken from this level. If the soil layer is thicker than 2 feet, one grab sample will be collected for each 2 feet of thickness. The shallow bedrock below this layer will also be sampled if encountered and if decomposed enough to allow sampling with the extractor bucket.

Within each of the three depth intervals, composite samples will be created from subsamples of distinct sub-layers exhibiting a thickness of 2 feet or greater if visually identified by the field geologist as having the potential to influence the environmental behavior of the stockpile (i.e., iron staining, presence of secondary mineral precipitates, high sulfide content, fine grained soil matrix, etc.). Excavation will proceed in 2-foot depth intervals. One subsample will be collected for each 2-foot interval and placed in a clean plastic bucket or bag. These subsamples will be composited over each interval of the same material type according to the coning and quartering procedures detailed in SOP 21. If significant layering is observed, subsamples will be collected of each interval 2 feet thick or greater.

Assuming the minimum number of three test pits are sampled, with one sample collected for each of the three depth intervals, a minimum number of nine composite samples would be collected.

3.3 Sampling Procedure

Soil sampling is modified from SOP 21, "Sample Collection From Soil Borings, Excavations, and Hand-dug Pits." All sampling activities will be documented according to SOP 2, "Field Logbook."

A project-specific sampling procedure was developed for depths below 4 ft bgs as follows:

- The backhoe operator will collect a volume of soil/stockpile with the bucket of the backhoe from each 2-foot interval or distinct layer and empty the bucket on the ground in the sampling area.
- The field geologist will describe stockpile characteristics by visual inspection and soil layers according to American Society for Testing and Materials Method D-2488, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)," which is based on the Unified Soil Classification System, but provides more detail.
- Approximately 1 gallon of the material will be transferred to a 3-gallon plastic bucket or bag, labeled with the depth interval, and held until the excavation is complete.
- Samples from each 2-foot interval will be composited by placing the materials from the 3-gallon buckets together on a clean sheet of plastic and mixing them together thoroughly. The composited sample will be photographed. The subsamples to be mixed will depend on the number of 2-foot intervals composited, which will be decided by the field geologist based on layering and types of materials present, as discussed in Section 3.1.2. It is anticipated that the upper 2 feet will comprise one composite, and all stockpile material below 2 ft bgs and above the pre-mining surface will comprise a second composite for each test pit.
- Two splits of approximately 1 kilogram each will be collected from the composited materials, placed in plastic Ziploc™ bags, and labeled according to SOP 4 "Sample Custody and Documentation Procedures." Samples will be doubled-bagged with

labeling on the inner and outer bag. One of these splits will be sent to SVL Analytical (SVL) in Kellogg, Idaho. The other split will be archived at Chino.

- Any grab samples collected from the soil or bedrock underlying the mine-related materials will be placed directly from the pile into plastic Ziploc™ bags and labeled according to SOP 4.
- The pit dimensions will be measured and documented, and the pit will then be back filled and compacted as described in SOP 21. A stake will be placed at the test pit location for survey by Chino.

4. QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Quality assurance/quality control (QA/QC) samples will be collected during the field investigation as outlined in SOP No. 3, "Field Quality Control." QA/QC samples will include Blind Decon Rinseate Blanks (BDRBs) and Blind Field Duplicates (BFDs). One BFD is typically collected for every 10 soil samples and one BDRB per 20 soil samples. Fewer than 20 samples will be collected, and therefore two BFDs and one BDRB will be collected.

5. SAMPLE DESIGNATION

Each sample of stockpile materials will be designated by a unique sample number consistent with SOP 1, "Field Document Control." Sample numbers will be determined during or before mobilization. Sample numbers will be consistent with other samples collected in tributaries of Whitewater Creek, designated U03-50-XX, where "U03" signifies Whitewater Creek, "5" signifies a tributary, "0" is Bayard Canyon, and XX will be used as the sample counter, beginning with the last sample number listed in Chino's database prior to field sampling.

6. DECONTAMINATION PROCEDURE

Decontamination of reusable sampling equipment will follow the procedures outlined in SOP 6, "Decontamination of Equipment Used to Sample Soil and Water," with the modification that no nitric acid rinse will be used on any equipment. In addition, the bucket of the excavator will be brushed out between samples with a broom or scrub brush to remove any loose material. Disposable equipment will be used to the extent possible to reduce opportunities for sample cross-contamination and to decrease decontamination requirements.

7. SAMPLE HANDLING AND ANALYSIS

Samples designated for laboratory analysis will be packaged and shipped to SVL in Kellogg, Idaho according to the procedures given in SOP 5, "Packaging and Shipping of Environmental Sample Containers." A chain-of-custody form will be completed listing each sample and will accompany the samples to the analytical laboratory. Analyses required for each sample will be noted on the chain-of-custody form. Sample chain-of-custody procedures are detailed in SOP 4, "Sample Custody and Documentation Procedures."

Stockpile samples will be double-bagged and labeled as described in Section 3.1.3. Stockpile archive samples in plastic bags will be stored in ice chests or 5-gallon buckets in a dry location at Chino facilities. Each bag will be labeled with the same information as the analytical sample.

Analyses of stockpile samples will be performed in accordance with the following methods:

- Total Metals Analysis (Digestion Method 3050),
- ABA (Modified Sobek),
- Paste pH (ASA Method 9), and
- SPLP (Method 1312).

Samples will be air-dried and crushed to 3/8-inch according the SPLP Method 1312 in the laboratory prior to analysis. The samples will not be sieved prior to crushing. An aliquot of each sample will then be pulverized to minus 160 mesh (approximately 0.09 millimeter) for ABA (Modified Sobek), paste pH, and total metals analysis (Method 3050). The remainder of each sample will be held by SVL for possible SPLP testing. SPLP testing will be performed on approximately 30 percent of the samples judged to be representative of the materials in the stockpile based on visual observations, ABA, and total metals results.

The analytical suite for stockpile samples is listed in Table 1. The suite for total metals includes all metals in discharge permit DP-526 ("F-list") plus aluminum; antimony; and molybdenum; and major cations (calcium, magnesium, potassium, and sodium). The SPLP analyte suite includes each of these analytes, plus major anions (chloride, fluoride, sulfate, and bicarbonate).

8. SURFACE WATER, SEEP, AND SPRING SURVEY

A visual inspection of the drainage sub-basin (Figure 2) will be conducted for the purpose of identifying surface water drainage patterns on and near the site, possible interaction between Groundhog No. 5 Stockpile materials and surface water, and any active seeps or springs on and/or near the site. Evidence of drainage patterns in the canyon wall and surrounding cut will be noted, as will areas of high moisture; areas of unusual evaporite deposition; or concentrations of phreatophytes, grasses, or other wetland-type vegetation.

If water is observed in the stream near the stockpile, a sample will be collected and analyzed for the parameters listed in Table 2. The parameters listed in Table 2 were selected for comparison to SPLP results for the stockpile materials (Section 7). Samples will be collected as per SOP 13, "Field Sampling of Stream Channels, Springs, and Seeps." Field parameters (temperature, electrical conductivity, and pH) will be measured as per SOP 11, "Field Measurements of pH, Specific Conductance, and Temperature for Aqueous Samples."

9. REPORTING

Results of this investigation will be provided to NMED in a letter of completion to be submitted after results of the field investigation have been evaluated. The letter will include:

- summary of the field investigation;
- test Pit logs;
- location map showing the surveyed locations of test pits;
- total metals, ABA, and SPLP analytical data;
- 1997 groundwater analytical data from GH-97-3; and
- surface water anaytical data for the new sample location near the toe of the stockpile.

Results of the characterization of stockpile materials will be reviewed to determine the need for additional groundwater information. Additional groundwater data would be collected by installation of a new well or rehabilitation of Well GH-97-3 if SPLP metal concentrations exceed NMWQCC standards or if the ABA data indicate acid generating potential. The results of stockpile material characterization and the need for additional groundwater data will be decided with concurrence of NMED staff. If additional groundwater data are collected, the completion report will include:

- boring log and well completion form, if an additional monitoring well is installed; and
- additional groundwater analytical data.

10. REFERENCES

Daniel B. Stephens and Associates, 1997. *Shallow Groundwater Monitoring Wells at the Groundhog Site. Prepared for Chino Mines Company, Hurley, New Mexico.* October 17, 1997.

Chino Mines Company and Steffen, Robertson, and Kirsten, 1997. *Administrative Order on Consent, Investigation Area Health and Safety Plan.* Prepared for Chino Mines Company, Hurley, New Mexico. January 1997.

Golder Associates, Inc., 2000. *Phase 1 Remedial Investigation Report, Hanover and Whitewater Creeks Investigation Units.* Prepared for Chino Mines Company, Hurley, New Mexico. May 25, 2000.

REVISED TABLES

TABLE 1
ANALYTICAL SUITE FOR STOCKPILE SAMPLES
GROUNDHOG NO. 5 STOCKPILE

Constituent	Total Metals Analysis[a]	SPLP[b] Analysis	Acid-base Accounting
Metals			
Aluminum	X	X	—
Antimony	X	X	—
Arsenic	X	X	—
Cadmium	X	X	—
Chromium (total)	X	X	—
Cobalt	X	X	—
Copper	X	X	—
Iron	X	X	—
Lead	X	X	—
Manganese	X	X	—
Molybdenum	X	X	—
Nickel	X	X	—
Selenium	X	X	—
Zinc	X	X	—
Major Anions			
Chloride	—	X	—
Fluoride	—	X	—
Sulfate	—	X	—
Bicarbonate	—	X	—
Major Cations			
Calcium	X	X	—
Magnesium	X	X	—
Potassium	X	X	—
Sodium	X	X	—
Physical Properties			
pH	—	X	—
Total dissolved solids	—	X	—
Acid-Base Accounting			
Sulfur Species	—	—	X
Bulk Neutralization Potential	—	—	X
Carbonate Neutralization Potential	—	—	X
Paste pH	—	—	X

Notes:

a=Synthetic Precipitation Leachate Procedure EPA Method 1312

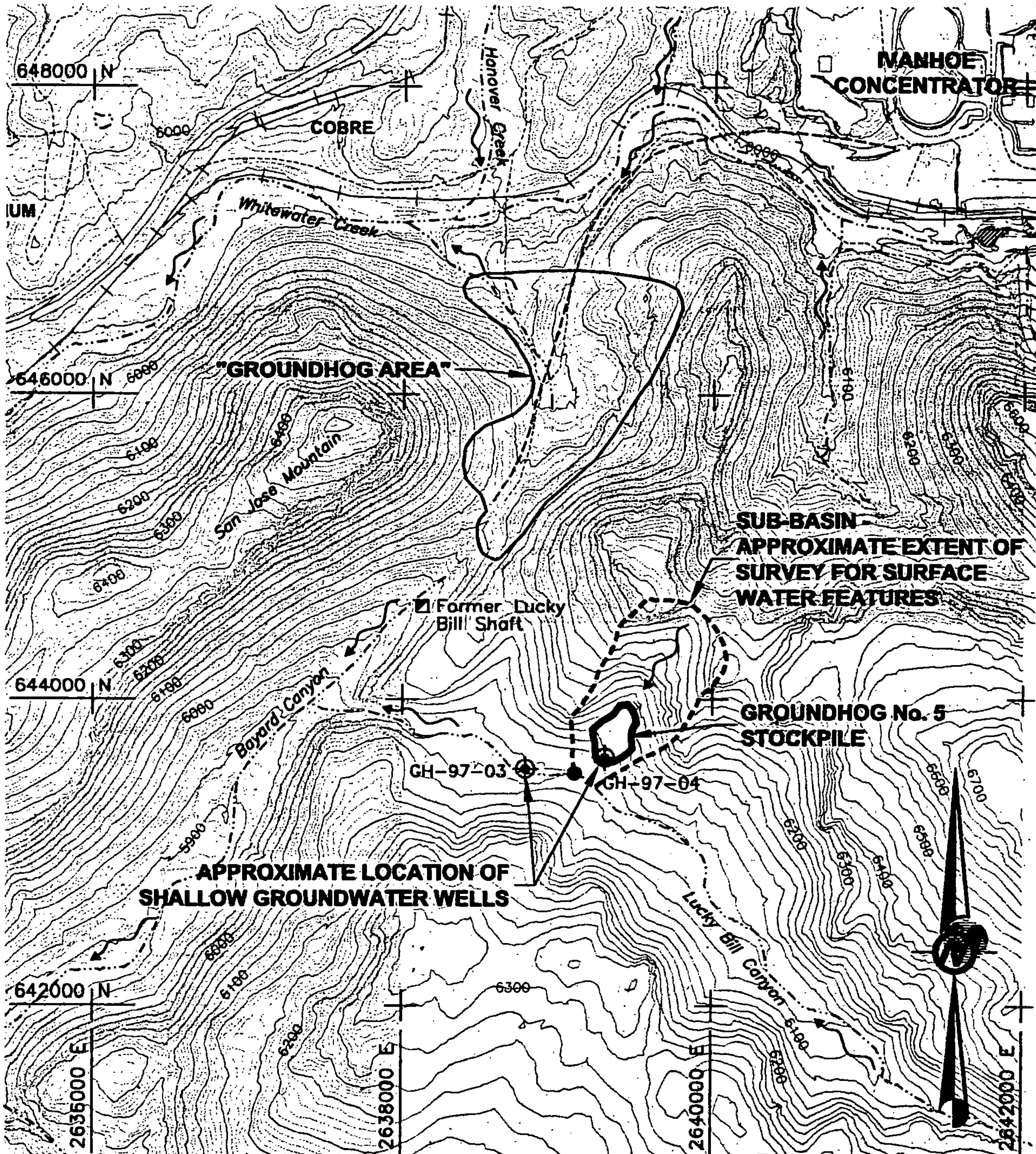
b=Digestion by EPA Method 3050

— denotes not applicable

TABLE 2
ANALYTICAL SUITE FOR SURFACE WATER
GROUNDHOG NO. 5 STOCKPILE

Constituent	Analytical Method
Field Parameters	
pH	—
Conductivity	—
Temperature	—
Metals	
Aluminum	200.7
Antimony	200.7
Arsenic	200.2
Cadmium	200.7
Chromium (total)	200.7
Cobalt	200.7
Copper	200.7
Iron	200.7
Lead	200.2
Manganese	200.7
Molybdenum	200.7
Nickel	200.7
Selenium	200.7
Zinc	200.7
Major Anions	
Chloride	300.0
Fluoride	200.7
Sulfate	300.0
Bicarbonate	300.0
Major Cations	
Calcium	200.7
Magnesium	200.7
Potassium	200.7
Sodium	200.7
Other Parameters	
Laboratory pH	150.1
Total Dissolved Solids	160.1

REVISED FIGURES



LEGEND

- WATERCOURSE
- DIRECTION OF FLOW
- SHALLOW GROUNDWATER WELL
- PROPOSED SURFACE WATER SAMPLINE LOCATION

1000 0 1000
1" to 1000' FEET
CONTOUR INTERVAL = 25 FEET

Golder Associates
Tucson, Arizona

PROJECT NO.	DATE	REVISION
953-1072-030	06/04/04	

FIGURE 2
GROUNDHOG No. 5 STOCKPILE LOCATION

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